

- 1 -

TITLE

PROCESS AND APPARATUS FOR EXTRACTION AT ROOM TEMPERATURE OF  
JUICE AND PUREE FROM FOOD PRODUCTS

5

TITLEDESCRIPTIONField of the invention

The present invention generally relates to machines for the food industry and specifically it relates to the extraction of juice and puree from vegetable or animal food.

In particular, the invention relates to a process for optimizing the efficiency of extraction at room temperature juice or puree from said food.

15

Background of the invention

As known, a variety exists of types of rotating machines (rough and fine extractors) for obtaining juice and puree mainly from vegetable food, fruit and vegetables, but also from animal food, meat and fish.

20

Normally, in a first step the product to treat is previously softened or chopped, more or less finely, for then being put in an extracting machine in a second step. The extracting machines of prior art are made up essentially of a fixed structure that comprises a perforated sheet of cylindrical or conic shape, also called screen, and a bladed rotor that rotates inside. The rotor is fitted on a shaft which rotates quickly driven by a motor. In particular, the chopped or softened product by centrifugal force is pushed radially and continuously against the screen. This way the product passes through the screen thus extracting the mostly liquid part that is conveyed for being then subject to further treatments. The solid part that do not pass through the screen, instead, is

25  
30

- 2 -

pushed axially opposite to the input and is automatically conveyed to an unloading section as waste to dispose. See on this subject IT1199392.

A known process of this kind is the extraction at  
5 room temperature that is carried out in two steps: in a first step the food pulps is softened by a plurality of pulses in quick succession and in a second step, which is carried out in an extracting apparatus as above described, the useful part (juice or puree) is separated from the  
10 waste solid part.

In room temperature extraction softening is obtained by pulses in quick succession produced by a cylindrical or conical body (stator), which has a plurality of protrusions on the inner surface, associated to a bladed rotor that  
15 turning in the stator pushes the food pulps by centrifugal force against the protrusions of the stator, giving rise to the softening. See on this subject IT1249363.

When extracting at room temperature, according to the above described prior art, the softening and extracting  
20 steps are gathered in a single compact working unit having a single motor: the respective rotors are mounted on a same axis and so rotate at a same speed. In this connection see hereinafter figure 1 and the relative description.

Such a unit gives good results for all those  
25 vegetables that, owing to a low consistency of their pulp (i.e. apples, peaches, pears, apricots), can be easily softened, but are less suitable for products having higher consistency (i.e. carrots, quinces, etc.) that require a stronger softening action to reach an optimal efficiency in  
30 the following extraction step.

The most effective way to boost the softening rate is to increase the speed of the respective rotor to obtain a double effect of having more pulses and at the same time to give each pulse a higher energy.

- 3 -

However, a higher speed of the rotor of the extracting apparatus different from the optimal can be problematic, both because the fraction of liquid and solid parts changes, and because the mechanical parts can be stressed in an incorrect way.

For this reason, the difficulty to soften certain fruit and vegetables having fibres of high consistency causes such fruit and vegetables to be scarcely used for juice or puree.

An opposite problem arises with products having a very soft pulp, for example watermelons, for which the softening step has to be very short and not much energetic, i.e. with low speed of the rotor, whereas the step of extraction can be carried out with much higher speed.

#### Summary of the invention

It is therefore a feature of the present invention to provide a process that is capable to optimize the efficiency of extraction at room temperature juice or puree from food pulps of fruit and vegetables, responsive to the consistency of the same, without encountering the above drawbacks.

It is another feature of the present invention to provide a machine that carries out this process.

These and other objects are accomplished by the process for optimizing the extraction at room temperature juice or puree, from food pulps of fruit and vegetables having a predetermined consistency, by a machine having:

- a softening section of the food pulps having at least a first stator and a first rotor, the first rotor rotating at a first speed:

- an extracting section having at least a second stator and a second rotor, the second rotor rotating at a second speed,

- 4 -

- speed adjusting means operatively connected to rotors driving means,

wherein the steps are provided of

- actuating the rotors driving means by said speed  
5 adjusting means according to a predetermined ratio between the first and the second speed responsive to an input parameter relative to the consistency of the food pulps.

In a possible exemplary embodiment said speed adjusting means comprise means for receiving an input  
10 parameter through a processor, and the steps are provided of:

- communicating to the processor an input parameter relative to the consistency of the food pulps;

- actuating the rotors driving means according to a  
15 predetermined ratio between the first and the second speed responsive to the input parameter.

According to another aspect of the invention, a machine for extracting at room temperature juice or puree from food pulps of fruit and vegetables having a  
20 predetermined consistency comprises:

- a softening section of the food pulps having at least a first stator and a first rotor, the first rotor rotating at a first speed:

- an extracting section having at least a second  
25 stator and a second rotor, the second rotor rotating at a second speed,

- a first motor for causing the first rotor to rotate at the first speed,

- a second motor for causing the second rotor to  
30 rotate at the second speed,

- a device for adjusting the speed and the efficiency of the machine having speed adjusting means operatively connected to the first and the second motor, whereby it is possible to operate the rotors driving means

- 5 -

by said speed adjusting means according to a predetermined ratio between the first and the second speed responsive to an input parameter relative to the consistency of the food pulps.

5        In a possible exemplary embodiment, said speed adjusting means comprise means for receiving an input parameter through a processor, and means are provided for setting in said processor an input parameter relative to the consistency of the food pulps, said rotors driving  
10 means according to a predetermined ratio between the first and the second speed responsive to the input parameter.

Alternatively, the speed adjusting means are means operated manually selected from the group: frequency variators, mechanical gearboxes.

15        In a first exemplary embodiment of the invention the first and the second motor have axes shifted from each other.

In a second exemplary embodiment of the invention the first and the second motor are coaxial.

20        Preferably, the first rotor is mounted on a first shaft and the second motor is mounted on a second shaft, wherein said first and second shaft are coaxial and pivotally engaged a within/on another, whereby they are capable of having speed independent from each other and of  
25 holding with respect to each other workloads.

#### Brief description of the drawings

The invention will now shown with the following description of an exemplary embodiment thereof, exemplifying but not limitative, with reference to the  
30 attached drawings wherein:

- figure 1 shows a longitudinal cross section of a rotating machine for obtaining juice or puree from vegetable or animal food with a traditional configuration;

- 6 -

- figure 2 shows a longitudinal cross section of a rotating machine for obtaining juice or puree in a first exemplary embodiment that carries out the process according to the invention;

5 - figure 3 shows a longitudinal cross section of a rotating machine for obtaining juice or puree in a second exemplary embodiment;

- figure 4 shows an advantageous exemplary embodiment of the position of the axes of the machine of figure 3.

10 Description of a preferred exemplary embodiment

With reference to figure 1, a rotating machine of prior art for extracting at room temperature juice or puree from vegetable or animal food comprises an input duct 1 where the fruit and vegetables are fed, such as fruit or  
15 vegetables, whole or cut parts, conveyed by a feeding screw not shown, operated along an axis 2 by a motor 3. In a first step is carried out the cut and softening the pulps, carried out in a first section of the machine, indicated as 4, not described in detail since known for example from  
20 IT1249363, where a first rotor 5 applies to the food pulps a plurality of pulses in quick succession against a stator that has protrusions on the inner surface.

If the product arrives to the first section 4 as whole fruit or large parts, co-axially and upstream from  
25 the rotor is mounted a rotating cutter comprising a plurality of knives suitable for chopping the product in smaller parts.

The softened product, exiting from first section 4, then passes through a second section 6, where the  
30 separation is carried out of the target parts of pulp (juice or puree), which are conveyed in an outlet duct 11, from the waste solid parts (peelings, seeds, hard fibres), which are disposed through an outlet 13. This second

- 7 -

section has a second rotor 7, which engages in a stator comprising a screen of equal size, as described in IT1199392.

The first and the second rotor 5 and 7 are both brought into rotation by a shaft 8 operated by a motor 9 and cantilevered by supports 17. This way, the number of turns of the two rotors 5 and 7 is the same.

According to the present invention (figures 2 and 3) rotor 5 is not mounted on the same shaft 8 of rotor 7, but on a different shaft 18 operated by a motor 19. Both motor 19 and motor 8 are operatively connected to a device 20 (or 30, figure 3) that controls the respective speed in a manual way, for example a speed variator, or automatically (figure 3) responsive to predetermined parameters, loaded as input according to the consistency of the product.

Preferably, each device 20 comprises a frequency variator associated to each motor 8 and 18, whereas the device 30 of figure 3 comprises a processor that sets the frequencies of each motor according to a function responsive to the input parameter relative to the consistency of the pulp of the fruit or the vegetables to treat.

In the exemplary embodiment of figure 2, rotor 5 is not co-axial to rotor 7, but first rotor 15 has an axis 12 different from the axis 2 of second rotor 7. This way, the softening section 4 and extraction section 6 are not adjacent but separated by a connection zone 10 for conveying forward the pulp for extraction. This solution allows to arrange both motors 9 and 19 on the respective axes 2 and 12 downstream of the respective sections 6 and 4. The connection zone can be a duct portion or an intermediate device on the path of the softened product that has to be extracted.

- 8 -

With reference to figure 3, another exemplary embodiment provides that rotor 5 maintains the co-axial configuration (axis 2) with rotor 7. This way softening section 4 and extraction section 6 are adjacent as in the solutions of prior art. However, the shafts 8 and 18 are always rotating independently from each other. In this exemplary embodiment, however, motor 19 is located upstream from the softening section of 4. In particular, shaft 18 crosses the input duct 1 for engaging first rotor 5.

10 In both embodiments the shafts 8 and 18 are cantilevered within the respective sections, and this can cause problems of vibrations and high stresses.

To avoid this, which can cause possible drawbacks, in the second exemplary embodiment of the invention the two shafts 8 and 18 can support each other. More precisely, as shown in figure 4, shaft 18 has a housing 15 with bearings 16 where it engages with the cantilevered end of shaft 8. This way, the speeds of the two shafts 8 and 18 are completely independent from each other and depend only from the respective motors 9 and 19. On the other hand, shaft 18 is supported in its rotation by shaft 8, steadily held by supports 17. This way shaft 18 can be sized in a lighter way, responsive to the torque and to orthogonal loads.

The foregoing description of a specific embodiment will so fully reveal the invention according to the conceptual point of view, so that others, by applying current knowledge, will be able to modify and/or adapt for various applications such an embodiment without further research and without parting from the invention, and it is therefore to be understood that such adaptations and modifications will have to be considered as equivalent to the specific embodiment. The means and the materials to realise the different functions described herein could have a different nature without, for this reason,



- 9 -

departing from the field of the invention. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.